First, the Office Action indicates that the record of the case contains no teaching of how to make silicon nanoparticles having a diameter of approximately 1 nm, even though the pending application specifically incorporates U.S. Application Serial No. 09/426,389, because "the case file is not available to the undersigned examiner." Applicants submit that the referenced application has now issued as U.S. Patent No. 6,585,947. With this Amendment, Applicants are submitting a copy of the '947 Patent, which clearly enables formation of silicon nanoparticles having a diameter of 1 nm.

Second, the Office Action separately states, regarding claims 5-7:

> [T]he specification does not provide any teaching of a device supporting single particle tunneling between a source and a drain through a plurality of silicon nanoparticles. Experimental data is present with respect to the device of figure 1 of the specification, but the devices of figure 6 or 7 appear to be speculative.

The Office Action further states:

> Specific differences between the two types of devices are: 1) the device of figure 1 has only a single particle, and the claims recite a plurality of particles, and 2) the device of figure 1 has a movable prong, and the claim recites source and drain electrodes which would not be movable. While single particle tunneling may have been shown with respect to the device of figure 1, undue experimentation would be required to generalize this result to produce a transistor having the regions recited in the claims. This is a particular problem with claims 6 and 7, which require hole creation by irradiation.

Applicants respectfully traverse these statements. Applicants first wish to point out that the device shown in figure 1 of the present application, which the Examiner observes has experimental data affiliated with it, includes a plurality of silicon nanoparticles in a film. The present specification clearly states, for example, on page 7, lines 6-8, "Silicon

nanoparticles contained in the film 14 are represented with an exaggerated dimension by the particle 18 in FIG. 1" (emphasis added). Applicants also refer to page 8, lines 15-17, which states, "...data was also taken with the FIG. 1 experimental set-up, with the film 14 containing nanoparticles 18 being stimulated by the light from a mercury lamp" (emphasis added).

In other words, both claims 5-7 and the device shown in figure 1 show/describe a plurality of silicon nanoparticles. Thus, the difference 1) mentioned in the Office Action does not exist. As to the difference 2), Applicants respectfully submit that claims 5-7 do not specifically require that that the source and drain not be movable. Instead, claim 5 defines, among other things, "a source" and "a drain", and the method of operation does not specifically require an immovable source.

Also, as to the contention in the Office Action that undue experimentation would be required to produce a transistor having the regions defined in the claims, Applicants respectfully submit that the present application, including Figures 1, 6, and 7, and their associated description, discloses and enables a single-electron device having a source, a drain, a gate, and 1 nm silicon nanoparticles implanted as a buried gate layer (nanoparticles 18, illustrated as a single particle), where at least one hole is created, by irradiating the silicon nanoparticles using light having a spectral width between 300 nm and 600 nm (see page 8. lines 17-18), and applying a voltage across the drain and the source (via tip 12, for example – see page 7, lines 11-18). Accordingly, the present specification and claims clearly support, and enable, claims 5-7.

For at least these reasons, Applicants respectfully submit that claims 1-2 and 4-8 are enabled by the present application. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection.

Claims 1, 4, 5, and 8 also stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Forbes and Pankove. Applicants respectfully traverse the rejection, as neither Chen, Forbes, nor Pankove disclose, teach, or suggest, among other things, a buried gate layer of silicon nanoparticles having a diameter of approximately 1 nm.

Regarding Chen and Pankove, Applicants incorporate by reference their remarks previously filed in Amendment D. Applicants respectfully submit that to this point the Office Action has not responded to Applicants' specific points as to Chen and Pankove, including requests of citation of support for previous assertions made, but instead the Office Action states, "The examiner's interpretation of the Chen reference is set forth in the previous Office actions, but this reference is largely moot in view of the Forbes teaching...". In view of this, Applicants' present remarks will focus on Forbes.

The Office Action states that Forbes "teaches each element of for example claim 1". However, Applicants respectfully submit that even if Forbes were to disclose a range that, at least in theory, touches the approximately 1 nm size defined in claim 1, this range would lack sufficient specificity to anticipate the approximately 1 nm size defined, as required according to MPEP 2231.03. In other words, claim 1 is directed to a relatively narrow range: that of sizes of approximately 1 nm, and Forbes merely discloses particles that "can be described as having a general diameter of approximately 10 Å to 100 Å".

Even this possible touching of ranges is not conceded by Applicants. Because Forbes does not describe specific sizes of its particles, and has no data regarding a particular embodiment, it appears as least as likely that the range of 10 – 100 Angstroms referred to as a "diameter" in Forbes refers to a dimension of a needle-shaped (cylindrical, ellipsoidal, e.g.) particle as it does a diameter as used in the present application. Applicants respectfully submit that the remarks submitted to this point, and the present application, both illustrate that the diameter presently referred to is in relation to a nanoparticle wherein the diameter confines the nanoparticle along three dimensions. A needle, for example, though perhaps having a thickness of 1 nm (and perhaps even described as having a cross-sectional "diameter" of 1 nm) but lengths in other dimensions significantly greater than 1 nm is not a nanoparticle having a diameter of approximately 1 nm as claimed.

With the present nanoparticles, the diameter can be used as the sole measure of its size, as this measurement confines the nanoparticle, basically, along its dimensions. The present specification refers to this confinement in various contexts, for example, for calculation of capacitance, number of atoms in a particle, etc. Note that this refers to dimensions of individual nanoparticles, and not films, pastes, etc. that can be made from a plurality of nanoparticles.

Forbes, on the other hand, discloses that the particles "may not be formed in a uniform sphere", and it is unclear if the shape of the nanoparticles of Forbes are known at all. The vague 10 – 100 Angstroms range in Forbes stated as a "general diameter", may arguably be because other dimensions of Forbes could not be or were not measured. In other words, it

is unclear in Forbes what range of particles has actually been made, or how these particles have been made.

Even if, only for the sake of argument, this broad range, in its widest possible interpretation, could be described as touching the relatively narrow range of claim 1, MPEP 2231.03 provides that when prior art discloses a range that touches a claimed range, but no specific examples falling within the claimed range are disclosed, a case by case determination must be made as to anticipation. In this case, Applicants submit that the range set out in Forbes is not specific at all, and no examples of embodiments having any specific sizes are disclosed.

Furthermore, Applicants submit that it would not be obvious to use approximately 1 nm silicon nanoparticles based on the teachings of Forbes. According to MPEP 2131.01, if a reference is used in a 35 U.S.C. § 102/103 combination rejection, and it is unclear if the reference teaches the range with sufficient specificity, the Examiner must provide reasons for anticipation as well as a motivational statement regarding obviousness. However, this anticipation and motivation appears absent from Forbes. Forbes only describes benefits of a nanocrystalline floating gate generally, and gives no ranges or examples besides the generally stated 10 – 100 Angstrom range.

According to MPEP 2144.05, even if a prima facie case of obviousness is shown (which Applicants are not conceding that it is), it can be rebutted by showing the criticality of the claimed range, generally by showing that the particular range achieves unexpected results relative to the claimed range. The present application is believed to

disclose unexpected results from use of approximately 1 nm silicon nanoparticles such as, but not limited to, a discrete set of states, near one hundred percent resolved single electron conductance resonance, and reducing dependence on liquid nitrogen or other cooling mechanisms. Accordingly, Applicants submit that, for at least these reasons, a range of approximately 1 nm is neither anticipated nor made obvious by Forbes.

Additionally, however, the lack of specific ranges or examples further reinforces Applicants' previous submission that Forbes does not enable the formation of 1 nm silicon nanoparticles. No data exists in Forbes that illustrates that approximately 1 nm silicon nanoparticles have been made, and no specific disclosure is provided for making them. Forbes lists the general techniques of annealing, chemical vapor deposition, rapid thermal annealing of amorphous silicon layers, or "other known techniques". Does this mean that any of these techniques can produce 1 nm silicon nanoparticles? This is unclear in the teachings of Forbes. No other disclosure of formation techniques appears to be present.

The Office Action states, "Issued patents are presumed to be valid." However, the issue is not the validity of the Forbes patent *per se*; the issue is whether the issued patent, Forbes, has an enabling disclosure with respect to forming approximately 1 nm silicon nanoparticles. A presumption of enablement of any reference (including patents) appears to apply with respect to the pending claims only if the reference expressly anticipates or makes obvious all of the elements of the claimed invention (MPEP 2121). Applicants submit, for at least the reasons stated above, that Forbes does not expressly anticipate or make obvious the approximately 1 nm diameter silicon nanoparticles claimed.

According to MPEP 2131.01 and 2121.02, secondary references can be provided to show public possession of the method of using or making. However, Applicants respectfully submit that such secondary references have not yet been presented.

In sum, it is highly questionable whether the vague and general range disclosed in Forbes is referring to that of a diameter of a particle as referred to in the present application. It is also questionable whether the range given in Forbes in an actual range with sufficient specificity to anticipate the range of the present invention. Even assuming for the sake of argument that this range actually does touch the range provided in the present claims, the vagueness of the range in Forbes, and Applicants' disclosure of unexpected results from its claimed range, are believed to constitute a sufficient rebuttal to even a prima facie case of obviousness. Finally, Forbes does not appear to shed light on these issues, as its disclosure provides no specific description of formation techniques for approximately 1 nm particles, no specific embodiments definitively including approximately 1 nm particles, and no experimental results measuring effects of approximately 1 nm particles in a transistor. Applicants repeat their assertion that it is highly questionable whether Forbes enables formation of silicon nanoparticles of approximately 1 nm.

For at least these reasons, Applicants respectfully submit that claims 1, 4, 5, and 8, and their respective dependent claims, are allowable over the references of record, including Forbes, Chen, Pankove.

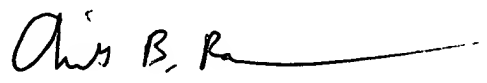
Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the references listed above and further in view of Matsumura. Applicants respectfully

traverse this rejection for at least the reasons stated above and for at least the additional reason that Matsumura does not appear to remedy the deficiencies of the other references with regard to claims 6 and 7.

For at least the foregoing reasons, Applicants believe that this case is in condition for allowance, which is respectfully requested. The Examiner should call Applicants' attorney if an interview would expedite prosecution.

Respectfully submitted,

GREER, BURNS & CRAIN, LTD.

By 

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